

This listing of claims will replace all prior versions and listings of claims.

Listing of Claims

Claims 1-15 (Canceled)

16. (Currently amended): A scanning head suitable for use with a printing press in a print register mark detection apparatus for detecting register marks on a web surface, the scanning head comprising:

an optical sensor;

a first optical mask spaced from the optical sensor, the first optical mask having an aperture therethrough; [[and]]

a second optical mask with an aperture in series with the first mask, the apertures of the first and second masks together defining the viewing footprint of the optical sensor;

a first light source for providing selective diffuse illumination of a web substrate; and

a second light source for providing selective direct reflection illumination of the web substrate.

17. (Original): A scanning head as claimed in claim 16, wherein the second mask is between the first mask and the sensor, and wherein the second mask is closer to the sensor than to the first mask.

18. (Original): A scanning head as claimed in claim 17, wherein the spacing between the first mask and the second mask is of the order of ten times greater than the spacing of the first mask from the surface.

19. (Original): A scanning head as claimed in claim 16, wherein the area of the aperture of the second mask is greater than that of the first mask.

20. (Original): A scanning head as claimed in claim 19, wherein the ratio between the area of the aperture of the second mask and the area of the aperture of the first mask is substantially the same as the ratio of the spacing of the first and second masks relative to the spacing of the first mask from the surface.

21. (Previously presented): A scanning head as claimed in claim 16, wherein the aperture of at least one of the first and second masks is of a shape that is the same as or similar to the shape of the registration mark sought on the web surface.

22. (Previously presented): A scanning head as claimed in claim 21, wherein the aperture of at least one of the first and second optical masks comprises multiple holes or slits.

23. (Original): A scanning head as claimed in claim 16, wherein the scanning head is configured to enable demounting of either of the first or second masks to allow for interchanging of masks with different aperture shapes or sizes.

24. (Currently amended) A printing press including a print register mark detection apparatus for detecting register marks on a printed paper substrate, the print register apparatus comprising:

a scanning head comprising:

an optical sensor,

a first optical mask spaced from the optical sensor, the first optical mask having an aperture therethrough,

a second optical mask having an aperture therethrough, the aperture of the second optical mask in series with the aperture of the first optical mask, the apertures of the first and second optical masks together defining the viewing footprint of the optical sensor, and

~~a light source for illuminating the paper substrate, the light source being a solid state, low power light source~~

a first light source for providing selective diffuse illumination of a web substrate,

a second light source for providing selective direct reflection illumination of the web substrate.

Claims 25 and 26 (Canceled).

27. (Currently amended) The printing press of claim 24, wherein the first and second light source includes a plurality of light sources, and wherein the light sources may be used independently of each other or together.

28. (Currently amended): The printing press of claim 24, wherein at least one of the first and second light source sources includes an LED.

29. (Previously presented): The scanning head of claim 16, wherein the first optical mask is positioned parallel to the web surface.

30. (Previously presented): The scanning head of claim 29, wherein the first optical mask is spaced from the web surface in the range of 2-5 mm.

31. (Previously presented): The scanning head of claim 16, further including at least one LED illuminating a viewed footprint of the web surface.

32. (Previously presented): A scanning head suitable for use with a printing press in a print register mark detection apparatus for detecting print register marks on a web substrate, the scanning head comprising:

- a first light source for providing selective diffuse illumination of a web substrate,
- a second light source for providing selective direct reflection illumination of the web substrate,
- an optical mask having an aperture therethrough and passing light reflected from the web substrate, and
- an optical sensor for receiving light passing through the aperture.

33. (Previously presented): The scanning head of claim 32, further including a means for selecting between operation of the first light source, the second light source, or both light sources.

34. (Previously presented): The scanning head of claim 33, wherein in the selecting means, the selection of the light sources is dependent upon the type of web substrate.

35. (Previously presented): The scanning head of claim 32, wherein at least one of the first and second light sources includes LEDs.

36. (Previously presented): The scanning head of claim 32, wherein at least one of the first and second light sources emits one of white light and UV light.

37. (Previously presented): The scanning head of claim 32, wherein one of the intensity and wavelength of at least one of the first and second light sources is adjustable.

38. (Previously presented): The scanning head of claim 32, wherein the first light source includes an axis oriented at 45 degrees with respect to a plane perpendicular to the web substrate.

39. (Previously presented): The scanning head of claim 32, wherein the second light source includes an axis oriented at 10 degrees with respect to a plane perpendicular to the web substrate.

40. (Previously presented): A scanning head suitable for use with a printing press in a print register mark detection apparatus for detecting print register marks on a web substrate, the scanning head comprising:

- an optical sensor,
- a first light source for providing diffuse illumination of the web substrate,
- a second light source for providing direct reflection illumination of the web substrate,
- a first optical mask having an aperture therethrough for passing light reflected from the web substrate, and
- means for selecting between operation of the first light source, the second light source or both light sources.

41. (Previously presented) The scanning head of claim 40, further including a second optical mask having an aperture therethrough, the aperture of the second optical mask in series with the aperture of the first optical mask.

42. (Previously presented): The scanning head of claim 40, wherein the first and second light sources include LEDs.

43. (Previously presented): The scanning head of claim 40, wherein the first and second light sources emit one of white light and UV light.

44. (Previously presented): The scanning head of claim 40, wherein the intensity of at least one of the first and second light sources is adjustable.

45. (Previously presented): The scanning head of claim 40, wherein the wavelength of at least one of the first and second light sources is adjustable.

46. (Previously presented): The scanning head of claim 40, wherein the first and second light sources are oriented at an angle with respect to a plane perpendicular to the web substrate, and wherein the angle of the first light source that is greater than the angle of the second light source.

47. (New): A scanning head suitable for use with a printing press in a print register mark detection apparatus for detecting print register marks on a web substrate, the scanning head comprising:

a first light source for providing selective diffuse illumination of a web substrate;

a second light source for providing selective direct reflection illumination of the web substrate;

an optical mask having an aperture therethrough and passing light reflected from the web substrate;

an optical sensor for receiving light passing through the aperture; and

a means for selecting between operation of the first light source, the second light source, or both light sources;

wherein in the selecting means, the selection of the light sources is dependent upon the type of web substrate.

48. (New): The scanning head of claim 47, wherein at least one of the first and second light sources includes LEDs.

49. (New): The scanning head of claim 47, wherein at least one of the first and second light sources emits one of white light and UV light.

50. (New): The scanning head of claim 47, wherein one of the intensity and wavelength of at least one of the first and second light sources is adjustable.

51. (New): The scanning head of claim 47, wherein the first light source includes an axis oriented at 45 degrees with respect to a plane perpendicular to the web substrate.

52. (New): The scanning head of claim 47, wherein the second light source includes an axis oriented at 10 degrees with respect to a plane perpendicular to the web substrate.

53. (New): A scanning head suitable for use with a printing press in a print register mark detection apparatus for detecting register marks on a web surface, the scanning head comprising:

- an optical sensor;
- a first optical mask spaced from the optical sensor, the first optical mask having an aperture therethrough;
- a second optical mask with an aperture in series with the first mask, the apertures of the first and second masks together defining the viewing footprint of the optical sensor;
- a first light source for providing selective diffuse illumination of a web substrate;
- a second light source for providing selective direct reflection illumination of the web substrate; and
- a means for selecting between operation of the first light source, the second light source, or both light sources;

wherein in the selecting means, the selection of the light sources is dependent upon the type of web substrate.

54. (New): A scanning head as claimed in claim 53, wherein the second mask is between the first mask and the sensor, and wherein the second mask is closer to the sensor than to the first mask.

55. (New): A scanning head as claimed in claim 53, wherein the area of the aperture of the second mask is greater than that of the first mask.

56. (New): A scanning head as claimed in claim 55, wherein the ratio between the area of the aperture of the second mask and the area of the aperture of the first mask is substantially the same as the ratio of the spacing of the first and second masks relative to the spacing of the first mask from the surface.

57. (New): A scanning head as claimed in claim 53, wherein the aperture of at least one of the first and second masks is of a shape that is the same as or similar to the shape of the registration mark sought on the web surface.

58. (New): A scanning head as claimed in claim 57, wherein the aperture of at least one of the first and second optical masks comprises multiple holes or slits.

59. (New): A scanning head as claimed in claim 53, wherein the scanning head is configured to enable demounting of either of the first or second masks to allow for interchanging of masks with different aperture shapes or sizes.

60. (New): The scanning head of claim 53, wherein at least one of the first and second light sources emits one of white light and UV light.

61. (New): The scanning head of claim 53, wherein one of the intensity and wavelength of at least one of the first and second light sources is adjustable.

62. (New): The scanning head of claim 53, wherein the first light source includes an axis oriented at 45 degrees with respect to a plane perpendicular to the web substrate.

63. (New): The scanning head of claim 53, wherein the second light source includes an axis oriented at 10 degrees with respect to a plane perpendicular to the web substrate.